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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/884,555	06/19/2001	Michael de La Chapelle	7784-000141CPB	3348

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EXAMINER	
PEREZ, ANGELICA	

ART UNIT	PAPER NUMBER
2684	

DATE MAILED: 01/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Suplemental Notice of Allowability	Application No. 09/884,555	Applicant(s) DE LA CHAPELLE ET AL.	
	Examiner Perez M. Angelica	Art Unit 2684	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *07/19/2005*.

2. ☒ The allowed claim(s) is/are *1-5,21-25 and 27*.

3. ☒ The drawings filed on *31 August 2005* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Supplemental Notice of Allowance

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Attorney Mark Elchuk on 11/9/2005.

In the Claim:

2. In claim 10 (original 25), line 4, after the term "maximum value", --.--has been added.

In the Specifications:

3. Paragraphs "[0029], [0032], [0048], [0049], [0058], [0067], [0083], [0084],[0086], [0087], [0091], [0093], [00102], [00115], [00151]" have been replaced with the following paragraphs of the same number, each rewritten in amendment format.

-- [0029] The preferred implementations of the present invention further make use of a dual, closed-loop power control method by which the central controller communicates with each of the mobile terminals within the coverage region, in accordance with a first closed control loop, and instructs each of the mobile terminals by transmitting commands thereto to increase or decrease its transmit EIRP as needed, based upon a receive signal-to-noise ratio ("Eb/No") of the monitored signal, to maintain communication link closure. With [[this]] this method, the ground station measures the Eb/No of the received RF signals and periodically sends commands

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back to the mobile terminals to increase or decrease the transmit power of each such mobile terminal to maintain the Eb/No within a desired control range.

[0032] In a preferred embodiment the present invention also makes use of a "reverse calculation" method for more accurately determining the PSD contribution of each mobile terminal. The "reverse calculation" method is a much more accurate method of determining aircraft PSD than "forward calculating" mobile terminal PSD by using an estimate of transmit EIRP made by the mobile terminal. In practice, it is both difficult and expensive for the mobile terminal to accurately estimate transmit EIRP. So the invention uses a novel method of "reverse calculating" mobile terminal EIRP by knowing the receive Eb/No at the ground station and working backwards through the link to determine the corresponding transmit EIRP of the mobile terminal. Once the transmit EIRP is determined, the PSD along the GEO plane and off of the GEO orbit plane can be determined in the manner described below.

[0048] FIGS. 11-13 are graphs of the PSD along the GEO arc of the RF signals transmitted by each of the three aircraft shown in FIG. 10; [[and]]

[0049] FIG. 14 is a graph illustrating how the aggregate PSD of the signals from the three aircraft shown FIG. 10 remains below the regulatory PSD limit at all points along the GEO arc; [[and]]

[0058] The content center 24 is in communication with a variety of external data content providers and controls the transmission of video and data information received by it to the ground station 22. Preferably, the content center 24 is in contact with an Internet service provider (ISP) 30, a video content source 32 and a public switched telephone network (PSTN) 34. Optionally, the content center 24 can also communicate with one or more virtual private networks (VPNs) 36. The ISP 30 provides Internet access to each of the occupants of each aircraft 12. The video content source 32 provides live television programming, for example, Cable News Network (CNN®) and ESPN®. The NOC 24 performs traditional network management, user authentication, accounting, customer service and billing tasks. The content center 24a associated with the ground station 22a in the second coverage region 14b would also preferably be in communication with an ISP 38, a video content provider 40, a PSTN 42, and optionally a

VPN 44. An optional air telephone system 28 may also be included as an alternative to the satellite return link.

[0067] An advantage of the present invention is that the system 10 is also capable of receiving DBS transmissions of live television programming (e.g., news, sports, weather, entertainment, etc.). Examples of DBS service providers include DirecTV [an d] and Echostar. DBS transmissions occur in a frequency band designated for broadcast satellite services (BSS) and are typically circularly polarized in North America. Therefore, a linear polarization converter may be optionally added to receive antenna 82 for receiving broadcast satellite services in North America. The FSS frequency band that carries the data services and the BSS frequency band that carries DBS transmissions are adjacent to each other in the Ku-band. In one optional embodiment of the system 10, a single Ku-band receive antenna can be used to receive either DBS transmissions from DBS satellites 18c and 18f in the BSS band or data services in the FSS band from one of the FSS satellites 18a or 18b, or both simultaneously using the same receive antenna 82. Simultaneous reception from multiple satellites 18 is accomplished using a multi-beam receive antenna 82 or by using a single beam receive antenna 82 with satellites co-located in the same geostationary orbit slot.

[0083] Maintaining the aggregate EIRP spectral density below the known regulatory limit requires that each mobile system 20 sharing a return link satellite transponder (e.g., transponder 18a.sub.1) be under strict transmit power control. The system 10 employs a dual loop control system method whereby the ground segment 16 measures the receive "Eb/No" for each mobile system 20 accessing, or attempting to access, the system. [with] With this method a first closed control loop is employed via the ground segment 16 to measure the receive Eb/No from each aircraft 12, and then to transmit EIRP control commands to the mobile system 20 to thereby maintain the Eb/No of the receive signal from the mobile system within a tight, predefined range. A second control loop implemented in the mobile system 20 on the aircraft 12 is used for maintaining the transmit EIRP at the level commanded by the ground segment 16, using [said] the first control loop, during rapid movement of the aircraft. The second control loop on the aircraft is often required for mobile transmit antennas, such as phased arrays, that experience changes in directivity (causing changes in EIRP) with scan angle. The preferred embodiment of the

invention includes [[said]] the second control loop but the invention may optionally be implemented without [[said]] the second control loop when using "constant aperture" transmit antennas, such as reflector and lens antennas, that do exhibit directivity changes with scan angle, or for mobile platforms that do not rapidly change attitude. The aircraft-to-ground control loop (i.e., the first control loop) has about 0.5 seconds of roundtrip GEO delay so it cannot react as quickly to aircraft movement.

[0084] The above-described dual control loop control method can maintain the receive signal Eb/No from each aircraft 12 within a tight control range of about +/-0.5 dB with about 99.7% probability for the full range of typical aircraft motion. This power control system achieves two important objectives: maintaining the receive Eb/No for all aircraft 12 above a threshold Eb/No level corresponding to a desired bit error rate (i.e., 1E-9); and maintaining the time variation of Eb/No within a tight control range (i.e., +/-0.5 dB). The goal is for the mobile terminals to use the minimum transmit EIRP (and hence PSD) to close the communication link with a desired bit error rate (BER). The threshold Eb/No level for a 1E-9 BER is dependent on the forward error correction (FEC) code selected [[(i.e., rate 1/3, rate, etc.)]] and other waveform parameters. One preferred Eb/No control range used by the system 10 is illustrated in FIG. 7. The performance of the control loop is determined by many design parameters, but key among them is the error in measuring receive Eb/No on the ground. The ground receiver (not shown) associated with the ground station 22 has typically fixed or slowly varying error in addition to a random (rapidly varying) error caused by the noise in the measurement value. In this example, the fixed error term requires that the control range be shifted up by 0.25 dB, as shown in FIG. 7, so that the actual Eb/No stays above the threshold level.

[0086] Movement of the aircraft 12a causes the largest and fastest control loop disturbances. The aircraft's 12a transmit antenna 74 is always pointing its beam at the target satellite 18a so that changes in pitch and roll of the aircraft cause the elevation scan angle of the antenna 74 (or antenna 82) of its mobile system 20 to vary, as shown in FIG. 8. A characteristic of a transmit phased array [[antennas]] antenna, if such is employed with the mobile system 20, is that the EIRP is proportional to cos.sup.1/2.theta., where .theta. is the elevation scan angle to the satellite 18a. Therefore aircraft pitch/roll disturbances can cause a change in antenna elevation scan angle, which can cause a change in antenna directivity, leading to a

change in EIRP. Changes in the EIRP lead to proportional changes in receive Eb/No on the ground, which is measured by the receiver at the ground station 22. The power control system then sends a command back to the aircraft to adjust EIRP, either up or down. In practice, the control loop managed by the mobile system 20 on each aircraft 12 minimizes the EIRP variations caused by aircraft disturbances, [[By]] by measuring the change in antenna elevation scan angle and adjusting the drive level into the antenna (and hence the transmit power) to compensate for the change in directivity of the antenna, thereby maintaining the EIRP at the last commanded level.

[0087] The NOC 26, as mentioned above, is also used to determine the PSD contribution of each mobile system 20 accessing (or attempting to access) the system 10. Determining the PSD of each mobile system 20 is accomplished using a "reverse calculation" method. The first step in determining aircraft PSD is to determine the EIRP of the signal of the transmitter subsystem 64 on the aircraft 12a. Rather than have each aircraft 12 directly report their EIRP to the NOC 26, the system 10 uses a much more accurate method to work backwards from a known receive Eb/No at the ground station 22 through the target satellite 18, to determine the transmit EIRP of the signal from the mobile system 20. In the preferred embodiment of the invention the performance of the return link is completely driven by the link between the aircraft 12a and the target satellite 18a. Under this condition the receive Eb/No at the ground station 22 is known to be identical to the Eb/No at the output of the satellite transponder. [[Using first principles, the]] The following equation for aircraft EIRP projected towards the target satellite 18a as a function of receive Eb/No at the ground station 22 is [[easily derived via]] represented by equation 1 below:

[0091] R=return link data rate [[.]]

[0093] [[K]] k = Boltzmann's constant

[0102] The geometry between the mobile terminal 20 and the target satellite 18 must be accurately [[know]] known to solve equations (1) and (2). Therefore, the invention includes a method whereby all mobile terminals 20, periodically report their location and attitude to the NOC 26 using the return link.

[0115] Because the PSD contribution from each mobile system 20 is dependent on its location (and scan angle in the case of PAA antennas), and the location of the aircraft 12 will change over time, the PSD contribution from each mobile system 20 will be time varying. Accordingly, the system 10 requires that each mobile system 20 periodically report its position and antenna pointing angle to the central controller 26a so that the PSD contribution of each mobile system 20 to the aggregate can be updated. However, the PSD of the RF signal from any given mobile system 20 is expected to change slowly with time, even for relatively fast moving mobile platforms such as commercial jet aircraft. Accordingly, the central controller 26a typically will not need to calculate mobile system PSD patterns more often than once every several minutes. The exception to this statement occurs for mobile antenna that have gain patterns that are very sensitive to scan angle (such as phased array antennas). Mobile systems 20 having these antennas must report their parameters (position and antenna scan angle) more often when [[the]] its associated aircraft [[or mobile system 20]] is rapidly changing it's heading or attitude.

[0151] Block 182 represents a "limited discrete time integrator" which is contained in the software on the ground. Block 182 produces the time integral of its input on its output. The integration is done in discrete time fashion using the [[so called]] so-called "Forward Euler" method. The sample period of this integrator is one second. The integrator is limited (so-called "anti-windup") in that it stops integrating when the output goes above a given value (or below the negative of that value). It will start integrating again when the input reverses its sign, thereby reducing the output from its limited value. --

(End of Amendment)

Note: Above amendment has been made in order to place the application in condition for allowance by adding the period at the end of claim 10 (original 25). The amendment to the specifications was done to correct errors found after the previous Notice of Allowance.

Allowance

4. Claims 1-5, 21-25 and 27 are allowed.

Reasons for allowance

5. Please see Reasons for allowance in Office Action dated June 17, 2005.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angelica Perez whose telephone number is 571-272-7885. The examiner can normally be reached on 7:00 a.m. - 3:30 p.m., Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nay Maung can be reached on (571) 272-7882. The fax phone numbers for the organization where this application or proceeding is assigned are 571-273-8300 for regular communications and for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either the PAIR or Public PAIR. Status information for unpublished applications is available through the Private PAIR only. For more information about the pair system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). Information regarding Patent Application Information Retrieval (PAIR) system can be found at 866-217-9197 (toll-free).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the TC 2600's customer service number is 703-306-0377.

Angelica Perez

(Examiner)

NAY MAUNG
SUPERVISORY PATENT EXAMINER

Art Unit 2684

November 9, 2005